

EARLY TYPE GALAXIES AND STRUCTURAL PARAMETERS FROM KiDS

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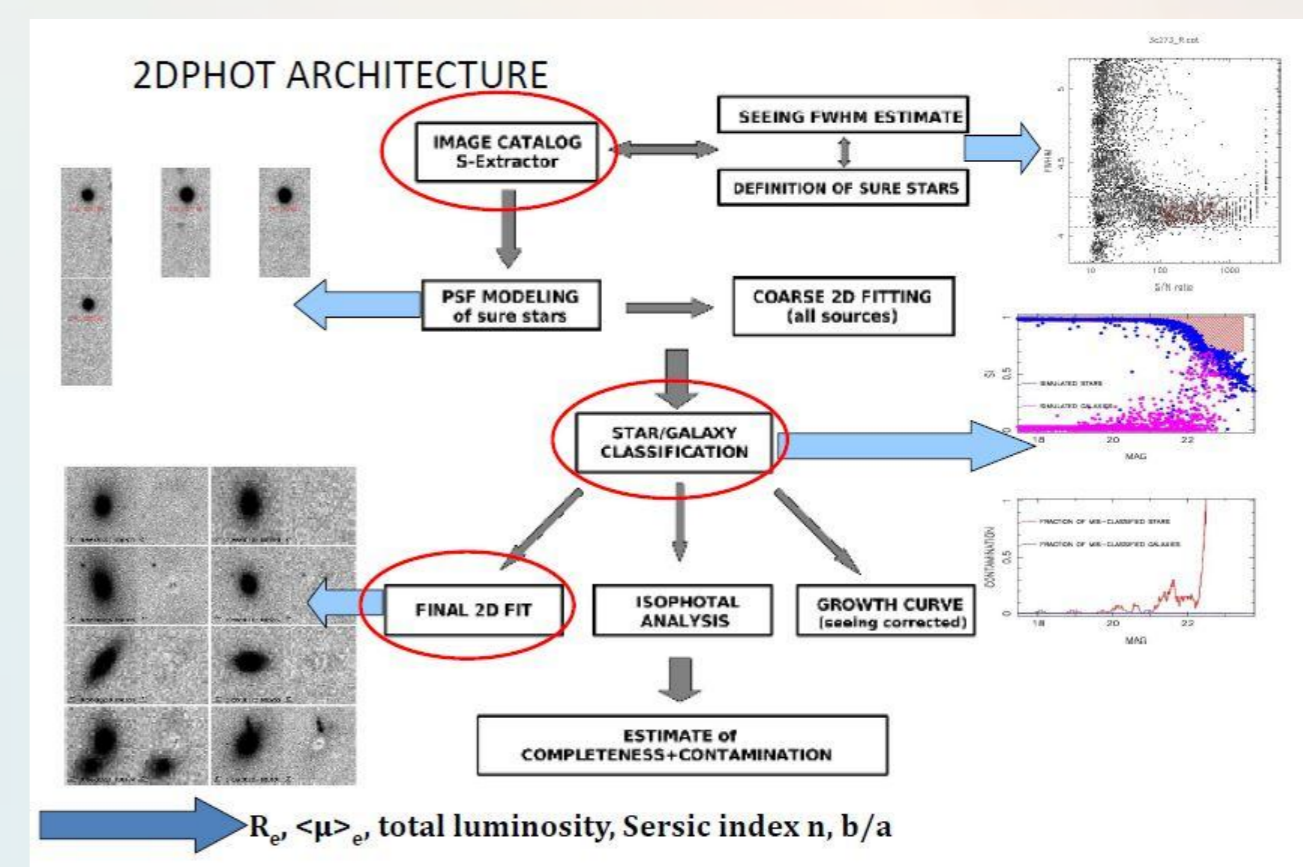
Introduction

Kilo Degree Survey (KiDS) is a large scale optical imaging survey. Using the VLT Survey Telescope (VST), situated at the ESO Paranal Observatory, the survey will cover 1500 square degrees of the night sky in four optical bands (u, g, r, i). The main goals of the survey are the study of dark energy, structure of galaxy halos, evolution of galaxies and clusters, the stellar streams and the galactic halo. The large area covered, the depth and the pixel scale make the VST the ideal tool to investigate the evolution of galaxies across the last billions of years. We expect to observe millions of galaxies for which we extract the structural parameters and analyze scaling relations up to redshift $z=0.5$. This provides insight into physical processes in the galaxy assembling. Here we present some preliminary results for structural parameters obtained in the r-band over 158 tiles of the KiDS survey which belongs to the recently delivered Data Release 2 (DR2). We will introduce the sample and the 2D fitting procedure. The outcomes of 2DPHOT for some example galaxies are shown in Figure 1. To have a clear idea about the consistency of the parameters extracted by 2DPHOT, in Figure 2 we have compared our results with the ones from the SPIDER survey. Figure 3 shows scaling relations and their evolution with redshift.

Sample and 2D fitting

From the whole galaxy population extracted within the KIDS DR2, we have selected those galaxies with r-band signal-to-noise ratio (S/N) >50 . This criterion allows one to obtain reliable structural parameters. Images are processed using 2DPHOT (La Barbera F. et al. 2008, PASP, 120, 681), an automated software environment which accomplishes several tasks such as catalog extraction (using SEXTRACTOR), star galaxy separation and surface photometry. Galaxy images were fitted with a PSF convolved Sérsic model (see outcomes in Figure 1). 2dphot model fitting will provide structural parameters like surface brightness, equivalent effective radius, Sérsic index, model magnitude, axial ratio, position angle, etc. We have also determined photometric redshifts using a Multi Layer Perceptron with Quasi Newton Algorithm (MLPQNA) model, which is an interpolative method derived from machine learning models and more efficient than standard Spectral Energy Distribution (SED) fitting techniques (Brescia, M. et al. 2014, A&A, 568, 126). The stellar masses and absolute magnitudes are determined from fitting Bruzual & Charlot (2003, MNRAS, 344, 1000) Stellar Population Synthesis (SPS) models to the observed $ugri$ aperture photometry. A standard Λ CDM cosmological model is adopted.

For scaling relations shown in Figure 3 we have finally sorted out a sample of ETGs complete up to $z=0.5$ by selecting those systems with a) the best 2D fitting ($\chi^2 < 1.5$), b) Sérsic index $n > 2.5$, c) stellar masses larger than $\sim 10^{10}$ solar masses.



Images from 2DPHOT

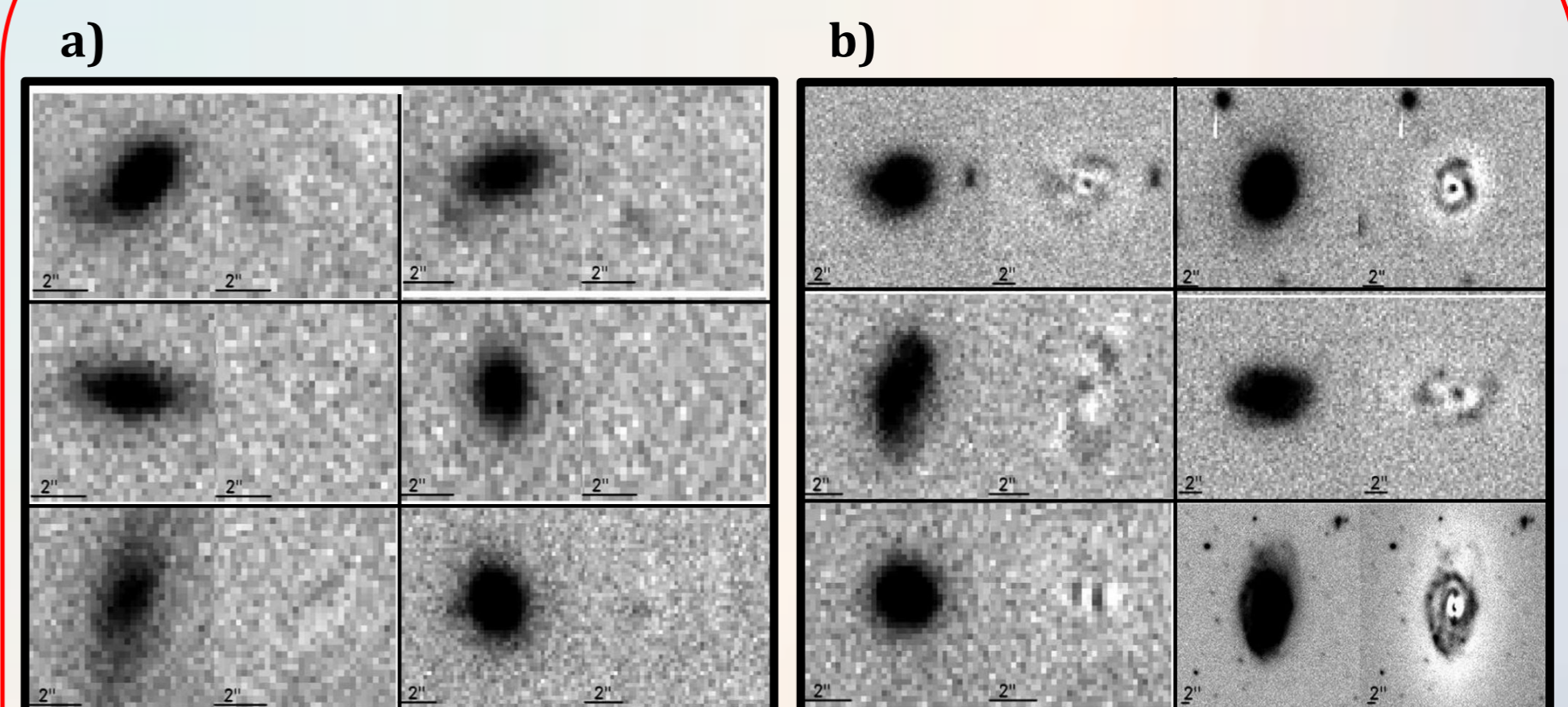


Figure 1. 2D fit results for 12 example galaxies in r-band. Each frame shows the galaxy stamp (left) and the residual map (right) after model subtraction. Panels a) are for $\chi^2 < 1.5$, while panels b) for $\chi^2 > 1.5$

KiDS vs. SPIDER

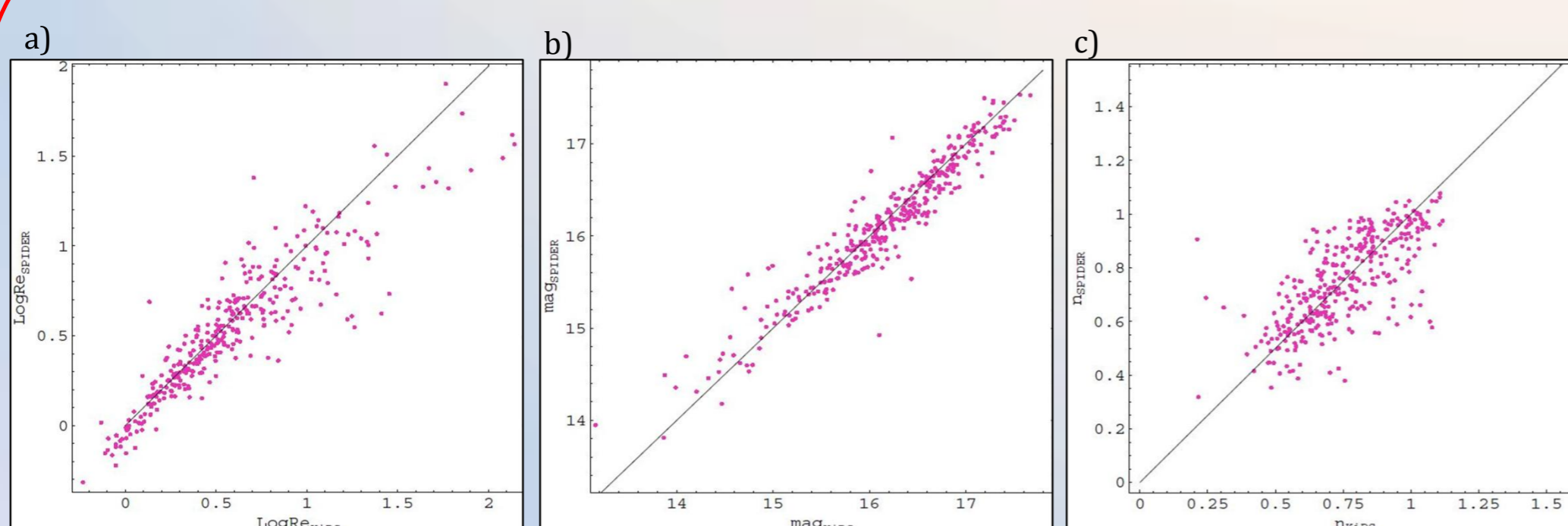


Figure 2. Comparison of structural parameters from KiDS and SPIDER. We compare our structural parameters with the ones derived within the SPIDER survey (La Barbera F. et al. 2010, MNRAS, 408, 1313). The SPIDER dataset consists of ETGs with redshifts in the range $0.05 < z < 0.095$, selected from SDSS; the structural parameters are derived using 2DPHOT. We show the relationship for a) effective radius, R_e , b) model magnitude and c) Sérsic index. Data are shown as pink points. The diagonal lines are the one-to-one relations, corresponding to the perfect agreement.

Scaling Relations

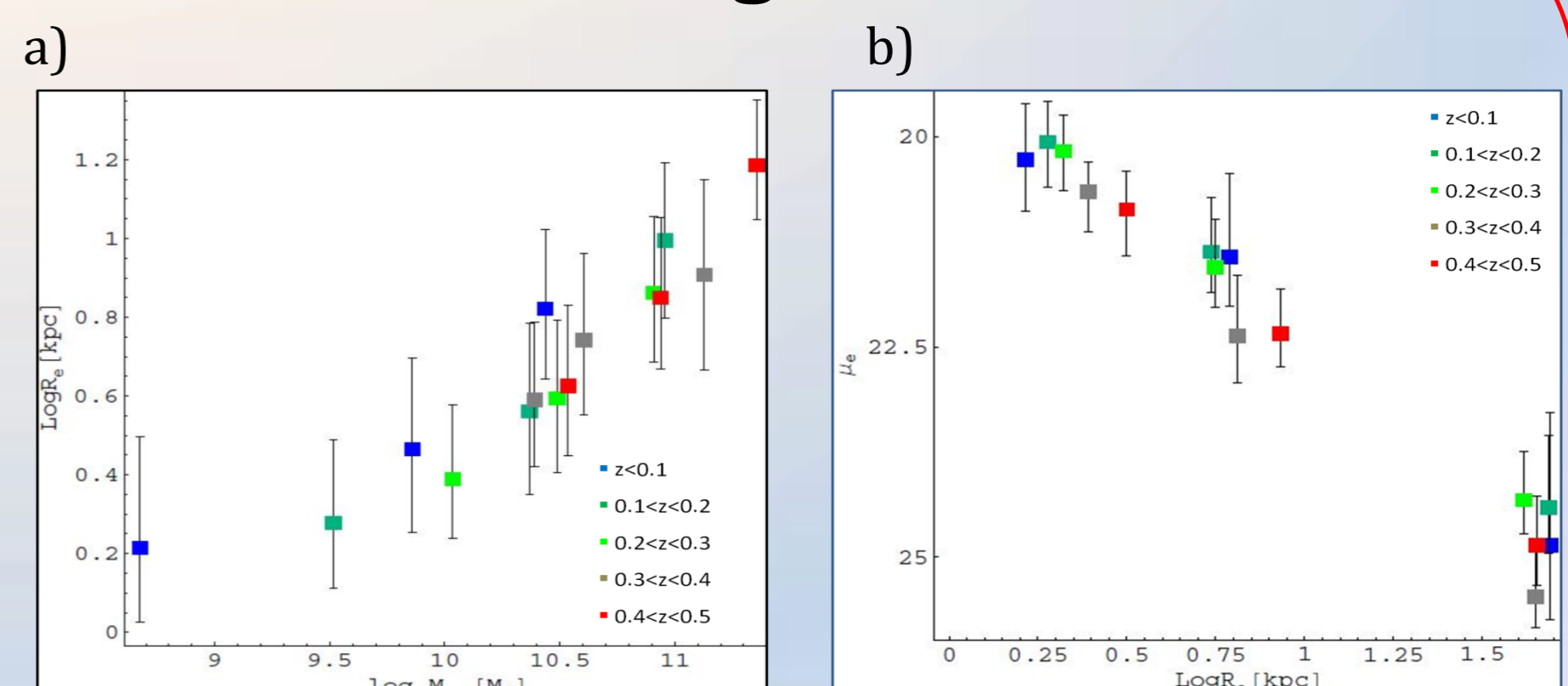


Figure 3. a) Effective radius vs. stellar mass b) mean surface brightness vs. effective radius. Medians and 25-75th quantiles are shown. Galaxies are binned in redshift intervals (see legend for color coding).